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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Malcolm Tom McKECHNIE et al. Art Unit : 1746
Serial No.: 09/308,860 Examiner: Alexander Markoff
Filed : January 12, 2001
Title : METHOD FOR CONTROLLING AND REMOVING DUST AND OTHER PARTICLES FROM A MATERIAL

BOX: Non-Fee Amendments
Commissioner for Patents
Washington, D.C. 20231

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LETTER UNDER 37 C.F.R. § 1.111

S I R :

This is in response to the Office Action of 6 June 2002. No amendments are being made at this time.

All the claims in this application have been rejected under 35 U.S.C. § 103(a).

5. Claims 24-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hughes (U.S. Patent No. 5,800,605; WO 96/01285; EP A 769,031) in view any one of Law et al (U.S. Patent No. 5,765,761), Sun et al (U.S. Patent No. 5,753,302) and Mitsumura et al (U.S. Patent No. 5,865,381).

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Hughes teaches that the methods and apparatuses for charging particles as claimed (tribo, frictional, discharge type) were contentional in the art. Hughes also teach the particles made of the same materials as claimed. Hughes further teaches the use of these charged particles for cleaning.

Hughes do not provide information regarding charge to mass ratio of the particles, thereby it is not clear from the reference whether or not the particles are the same as claimed.

However, the particles with the charge to mass ratio as claimed have been conventional in the art as evidenced by Sun et al, Law et al, and Mitsumura et al.

These references also show that charge to mass ratio is important and result effective parameter.

Having the combined teachings of the references it would have been obvious to an ordinary artisan at the time the invention was made to make the particles of Hughes by any conventional apparatus with the charge to mass ratio disclosed by Sun et al. Law et al., and Matsumura et al, because such charge to mass ratio was conventional.

Moreover, it would have been obvious to an ordinary artisan at the time the invention was made to find charge to mass ratio by routine experimentation depending from the application requirements.

This rejection is respectfully traversed and reconsideration is requested in view of these remarks.

The primary reference is Hughes U.S. Patent No. 5,800,605 ("Hughes") which is the equivalent of published PCT Application No. WO 96/01285 and

European Patent Application No. 0,769,031; for convenience sake, the reference will be discussed in terms of the U.S. '605 patent.

The invention sought to be patented is concerned with methods and apparatus for removing dust and other particles from a material, particularly carpets and similar fabric materials. In one aspect, Claims 24-34, the invention is directed to a method comprising the steps of (1) electrically charging carrier particles in powder form, (2) delivering the charged carrier particles to the material to be treated, whereby the dust and fine particles in the material agglomerate with the charged carrier particles, and (3) removing the resultant agglomerates from the material. There is an optional agitation step which can occur at the time the carrier particles are applied to the material, or as an intermediate step between such application and removal of the agglomerates, or at the time the agglomerates are removed. Typically, the agglomerates will be removed by vacuuming or brushing. In other aspects, Claims 41-54, the invention is directed to methods for applying charged carrier particles to surfaces such as carpets or fabric materials, which methods comprise providing a container for storing uncharged carrier particles and electrostatically charging the particles to the specified charge-to-mass ratio level when the particles are delivered to the surface intended to be treated. Other aspects of the invention, Claims 35-40 and 55, are concerned with apparatus for charging the carrier particles and dispensing the charged particles.

Content of the References

Hughes, the primary reference, describes a method for producing permanently charged solid particles. Electrostatically charged particles are prepared by incorporating a unipolar polar charge into a high resistivity material at a temperature at or above the glass transition temperature or above the melting

point of said material. The unipolar charge is either incorporated into the bulk of the material and the charged material is subsequently comminuted, or the charge is incorporated into the material simultaneously with the formation of particles by, for example, extrusion through a nozzle of predetermined aperture. The result is permanently pre-charged particles, which are charged in a separate manufacturing stage rather than being charged immediately prior to use – column 2, line 54. In the instant application, applicants require that the subject particles have a charge-to-mass ratio of $\pm$ 1 x 10^{-4} C/kg, but the Hughes reference does not disclose any particular charge-to-mass ratios.

As secondary references, the examiner cites Law et al. U.S. Patent No. 5,765,761 ("Law"), Sun et al. U.S. Patent No. 5,753,302 ("Sun") and Mitsumura et al. U.S. Patent No. 5,865,381 ("Mitsumura"). These references, which have little relevance to applicants' claimed methods or apparatus, are cited by the examiner to show particles having a charge-to- mass ratio which meet applicants' requirements.

Law is concerned with an induction charging system in which a charge is induced in liquid droplets by passing the droplets through an electric induction field.

Sun is concerned with an accoustic dispenser for the propulsion of particles towards a substrate. The dispenser can be used with numerous types of objects, and the objects may be particles in dry powder form. The reference describes the charging of two particular sizes of solid particles. For example, at column 14, line 60, it is disclosed that small particles are charged before application to the accoustic dispenser by admixture with carrier beads. Larger particles, i.e., those greater than about 50 μ, can be charged directly without the use of carrier beads. But regardless of whether or not a carrier bead is needed, there is still a

requirement for electrically biasing a mesh grid electrode in order to deliver the particles toward the target; see Figure 7A and the discussion at column 3, lines 40-43, at column 7, lines 31-33, and at column 12, lines 26-32.

Mitsumura concerns the modification of surface properties of solid toner particles, in order to change the particles for improved photocopying application. Essentially, what this reference discloses is fixing or implanting, onto the surfaces of solid larger particles ("mother particles"), smaller particles ("daughter particles") and thus modifying the surface characteristics of the mother particles. The composite particles produced according to the disclosed invention can be transformed – apparently by methods not disclosed in the referrence – into particles that have a charge-to-mass ratio greater than applicants' minimum requirement – column 18, lines 22-30. Although the terms "charging" and "discharging" are used, these refer to the steps of introducing solid particles into a treating chamber and to removing the particles from said chamber. In Figure 2, reference numeral 30 is a "powder charging aperture" (column 9, line 41) and reference numerals 10a and 10 d are "powder discharging apertures" (column 9, line 54, and column 10, line 5). The only relevant aspect of this reference is an acknowledgement that there exist particles bearing the charge-to-mass ratio required by applicants. However, applicants are not making claims to such particles themselves.

The applicability of these references will now be discussed with respect to the various claims in this application.

Claims 24-34

These claims are directed to a method for controlling and removing dust and similar fine particles from a material. It is a three-step process, involving (1) electrostatically charging carrier particles so that they achieve a minimum charge to mass ratio of $\pm$ 1 x 10^{-4} C/kg, (2) delivering the charged carrier particles to the material, thus causing the charged carrier particles to agglomerate with the dust or other fine particles in the material, and (3) removing the resultant agglomerates. As disclosed in applicants' written description – page 3, line 27, through page 4, line 11 – either the carrier particles can be stored in a container or device in an uncharged state and charged as they are being delivered, or the carrier particles may be charged and stored in a container before they are delivered to the material. With respect to the pre-charged embodiment of the process, applicants have acknoweldged European Patent Application No. 95921916.3, published as EP 0,769,031, which is the equivalent of Hughes U.S. Patent No. 5,800,605.

The art cited by the examiner is relevant, at most, only to the first step of applicants' claimed process; i.e., the step of electrically charging powder particles. There is no teaching in Hughes, the primary reference, of anything resembling applicants' second step of delivering the electrostatically charged carrier particles to a material in order to create agglomerates or of applicant's third step which is removal of the agglomerates.

Three secondary references are cited, but none of them teach applicants' required second or third steps. Law is directed to the charging of liquid droplets and therefore is totally inappropriate as a reference since it does not even teach or even suggest applicants' first step, namely electrostatically charging particles in powder form. Furthermore, this reference is not concerned with removing dust or other fine particles from a material. Indeed, the spray charging system disclosed in the reference is designed for use in spraying liquids in "harsh agricultural and industrial applications" – column 6, line 6.

Combining the disclosures of Hughes and Sun would not enable a person skilled in the art to arrive at applicants' claimed invention. Sun teaches the agglomeration of small toner particles with larger particles by means of tribo charging. In applicant's invention, the carrier particles do not agglomerate when they are charged; rather, applicants' charged carrier particles are used for dust (or other fine particles) removal by the step of delivering electrostatically charged carrier particles to the dust and causing agglomeration with the dust particles, not with other carrier particles. If applicants' charged particles were replaced with the agglomerated particles disclosed in the Sun reference and delivered to the surface of a material, the agglomerated particles would not readily further agglomerate with the dust or other fine particles resident upon the surface or in the fabric material to be treated.

Mitsumura is concerned primarily with an apparatus for surface treating of solid particles in order to improve their characteristics for photocopying applications, such as, for example, improved flowability (column 7, lines 37-40), and improved agglomeration (column 8, lines 41-45). The method involves adhering or fixing onto the surface of solid matrix particles, plastic solid "daughter particles" smaller than the matrix particles, thereby forming a film on the surface

of the matrix particles – column 5, lines 35-42. Applicants' claimed process does not involve anything having to do with forming films on the surface of carrier particles, dust or other fine particles. The Mitsumura reference has no relevance at all to applicants' process and combining the disclosure of Hughes and Mitsumura would not render applicants' claims obvious.

Claims 35-55

Claims 35-40 are directed for an apparatus for delivering electrostatically charged particles to a carpet or fabric material. Claim 55 is directed more generally to an apparatus for dispensing charged particles. Claims 41-54 are directed to various methods involving the use of the claimed apparatus. In all of these claims, the particles are charged within the claimed apparatus or as part of the claimed process. With respect to the apparatus, the particles are delivered from a container containing uncharged particles via a delivery means during which the carrier particles become electrostatically charged by frictional contact with the delivery system. Thus, the particles are charged in situ at the point of delivery to the fabric, carpet or other material to be treated. This is in direct contact to Hughes, the primary reference, which teaches tribo charging of particles that are "pre-charged at the manufacturing stage, rather than being charged immediately prior to use" – column 2, line 56.

In applicants' claims, the delivery mechanism requires no external power sources such as electrically biased electrodes or accoustic dispenser apparatus, as in Law or Sun. Furthermore, there is no requirement for particles of different sizes to be used, with one particle acting as a carrier for other particles, as in Mitsumura.

Therefore, the cited references are even more remote fom Claims 35-55 than they are for Claims 24-34.

Conclusion

In view of the foregoing remarks, it is believed that all of the claims in this application are in condition for allowance. Favorable action is requested.

Respectfully submitted,

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